CLINTON LABORATORIES

TO   R. L. Doan   DEPARTMENT

FROM   M. C. Leverett per J. A. Lane   DEPARTMENT
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IN RE:

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On the attached pages are tables summarizing the essential data of the metal wastes sent to W-9 and W-10 from runs C-131.

The data are taken from the operating logs of the 205 Building since there is at present no satisfactory agitating and sampling equipment on these tanks.

A complete tabulation of all materials weighed into the process from scales and jetted to the storage tanks from the neutralization tanks has been made; the overall material balance is ~100%. This is quite good in view of the fact (1) the measurement of materials out of the 205 Building is made by liquid level and specific gravity measurements, (2) no measurement of the NO_2, NO and CO_2 gases involved has been made and (3) the amount of $BiPO_4$ cake removed per run was estimated to be 20 lbs.

It is planned to keep the metal waste summary up to date with semimonthly tabulations of future runs.

For the calculation of the waste composition, it was assumed that:

1. The metal solution equation was

$$U + 5.5\ HNO_3 + 3.25\ H_2O = UO_2 \cdot (NO_3)_2 \cdot 6H_2O + 2.25\ NO_2 + 1.25\ NO .$$
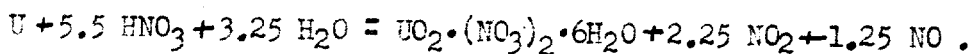
2. All Bi^{++} was precipitated.

3. Equal amounts of Na_2CO_3 and $NaHCO_3$ are found.

Water was calculated by difference.

The activity of the metal waste has been calculated from an average of the daily measured activities of the solutions from the dissolver. These values have been multiplied by one-third to allow for the decay of the solution in the waste tank. The measured values agree with those calculated on the basis of 700 KW operation of the pile for 60 days and 35 days cooling. Values are given in Table 1.

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Table I

Experimental Basis

1. Decontamination factor for 1st extraction step $= 10$

2. Daily gamma activity $= 1.6 \times 10^6$ counts/min per g UNH

3. Daily beta activity $= 3.0 \times 10^8$ counts/min per g UNH

Activity of Waste in W-9 and W-10

	β or total curies	γ curies	watts γ	watts β
per lb UNH	0.22	0.12	6×10^{-4}	9×10^{-4}
per lb U	0.47	0.24	12×10^{-4}	19×10^{-4}
per batch (1/3 ton U)	311	163	8.1×10^{-1}	12.4×10^{-1}
per lb neut. waste	0.02	0.01	5×10^{-5}	8×10^{-5}
per gal neut. waste	0.20	0.11	5.5×10^{-4}	8×10^{-4}

Wattage Energy Distribution of Waste

2.1 Mev gamma	5%
0.8 Mev gamma	25%
0.3 Mev gamma	10%
0.7 Mev beta	60%

Table II

Overall Material Balance

Process Solution	1,135,000 lbs.
Jet Dilution	68,000
30% Na_2CO_3	945,000
	2,148,000 lbs. In

Jetted from Neutralizer	2,058,000 lbs.
Jet Dilution to W-9, W-10	10,000
	2,068,000 lbs. Out

Jetted from Neutralizer	2,058,000 lbs.
$BiPO_4$ cake	3,000
$NO_2 + NO$ gases to stack	52,000
CO_2 neutralization gases	43,000
	2,156,000 lbs. Out

Overall Material Balance $= 2156000/2149000 = 100.2\%$

Charged to Waste Tanks $= 2068000/2149000 = 96.5\%$

Table III

Calculated Waste Composition

Lbs.			%
$UO_2 \cdot (NO_3)_2 \cdot 6H_2O$	=	186,000	9.0
Na_3PO_4	=	99,500	4.8
Na_2SO_4	=	58,000	2.8
$NaHCO_3$	=	77,500	2.7
$NaUO_3$	=	15,600	0.8
Na_2CO_3	=	77,500	3.7
H_2O	=	1,554,600	75.2
		2,068,700 lbs.	100.0

Solution pH $= 8.5 - 9.0$

Aver. Specific Gravity $= 1.23$

% Solids $=$ Negligible

Total Waste Volume $=$ 26,800 cu. ft.
$=$ 200,000 gal.